EXHBIT 1

(FILED UNDER SEAL)

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MINNESOTA

IN RE: MDL No.14-2551
NATIONAL HOCKEY LEAGUE (SRN/JSM)
PLAYERS' CONCUSSION INJURY
LITIGATION.

VIDEOTAPE DEPOSITION OF JAMES R. FUNK
Friday, January 26, 2018
8:34 a.m.
Skadden, Arps, Slate, Meagher & Flom
1440 New York Avenue, N.W.
Washington, D.C.
Sara A. Watt, RPR, RMR, CRR

a threshold in the sense of a bright line above which injury always occurs and below which injury never occurs. So the word "threshold" is a little fraught.

Q. With?

A. With ambiguity.

Q. As part of that project did you make an assessment that certain collisions or impacts would in fact result in brain injury?

A. No, I wouldn't put it that way. I would say we made an assessment of the risk of brain injury based on the biomechanical measurements we recorded.

Q. And was the level of that risk of brain injury based on these known values that you described in the field or from literature?

A. Yes, sir.

Q. Okay. Outside of the pedestrian protection project were there any other projects you worked on in that position as a visiting researcher in which you determined the risk of brain injury from assessing testing?

A. I don't believe so.

Q. You're also a senior consultant at Biocore; is that right?

preceding April, 2017; is that right?

A. Yes, sir.

Q. Okay. Do you know whether you submitted an expert report in every one of these cases?

A. I probably did not.

Q. Okay. Do you have any idea as you look at it here today how many of these you would not have submitted an expert report for?

A. The majority probably would have a report, but sometimes I'm not asked to write a report.

Q. Can you tell me in how many of these cases you were retained by the plaintiff as opposed to the defendant?

A. I'm not sure. We could -- we could go through them, I guess. It would be a majority defense, but I have a -- I have a number of plaintiff cases as well.

Q. Okay. Can you tell me which of these you represented the plaintiff in?

A. Well, to be clear, I don't represent anybody --

Q. I'm sorry, thank you.

A. -- in any of these cases. I would be working for an attorney who represents a plaintiff.

Q. Great clarification.
A. I do the same work regardless of which side I'm working for.
Q. Sure.
A. Al-Nobani versus Cernov was a plaintiff case. Oadeh, Firas versus Fagan was a plaintiff case. Horn was a plaintiff case.
I'm not sure about all of these, but those three were definitely plaintiff cases.
Q. Okay. Were any of these cases related to head injuries sustained in sports?
A. Yes.
Q. Okay. Can you tell me which ones?
A. For example, the Doll case here is an exercise equipment case that involved an eye injury.
Q. Okay. Any others?
A. Hetzel involved a neck injury in golf. Dennett involved a neck injury from a mechanical bull. I'm including neck because there sometimes is minor head injury, too.
I think that's -- that might be it.
Q. Do you -- strike that.
Have you testified in trial or deposition in any cases since April, 2017, that aren't listed

on this, since it's been nearly a year?

A. Yes.

Q. Okay. Can you tell me what those cases are?

A. Not off the top of my head.

Q. Let me ask a different question maybe.

Can you tell me about how many there are?

A. It's maybe every month or two I might have a testifying event, roughly, on average. So there may be another, you know, five or ten. I'm not sure exactly.

Q. And of the five or ten that have taken place, would you have submitted expert reports in the majority of those?

A. Probably. I'm -- again, I'm not certain. I'd have to -- I'd have to see what the cases are.

Q. Do you recall whether any of them involved head injury as the result of sports?

A. I don't.

Q. Is that something you would be able to produce to counsel?

A. Yes. I --

Q. An up --

A. An updated testifying history, I can produce.

analysis. And, therefore, they are unable to match their reconstructions to the actual event, because you need to be able to match the pre- and the post-impact motion.

And then the purpose of doing the reconstruction is to get finer detail on what is happening during the instant of impact, which is a very brief span of time, too quick for video to capture anything that's going on. That's the purpose of the reconstructions.

If you only have half of the information, you only know the speeds going in but you don't know velocities coming out, then it's impossible to know if you've accurately reconstructed that impact.

Q. So your issue as to not accounting for post-impact velocity is not that the equipment used in the reconstruction may have allowed for some post-impact movement. Your issue is that they never measured the post-impact velocity of the struck player in the video and, therefore, they couldn't -- it didn't matter what equipment they were using, they didn't have anything to match it?

MS. MILLER: Objection.

BY MR. RENZ:

mean pre- and post-impact velocity in all six degrees of freedom.

Q. Okay. And that is something that remains available, does it not? The videos?

A. Oh, the videos exist, but they -- but the vast majority that I've seen, there's only one camera view, which was going to be insufficient to get that level of information.

Q. Okay. And so do I understand your testimony then to be that there is no way that a person, based on the video that was used, could ever have enough information to know whether the reenactments matched the impacts on the video?

A. Yes, that's correct. The baseline information of just having one camera view of all these events just simply doesn't provide enough information to do a thorough video analysis or a reconstruction or any -- or a finite element model or anything else.

Q. Do you know whether there was any other video available?

A. No, I do not.

Q. Okay. If there was no other video available, what is one to do? Is it simply something that can't be done?

A. Yeah, that's correct. Simply because you don't have all of the information or test capability to do something doesn't mean that you should do it anyway. You have to design your study so that you have the tools available to accomplish your objectives. And that was not done here.

Q. Okay. And so until -- until such time as the video footage that was available or used has more than one camera angle on the impact, those reconstructions and the resulting data are, in your view, not scientifically sound?

MS. MILLER: Objection.

THE WITNESS: That's correct. And it would take more than just finding another camera view. Then the analysis would have to be redone. The impactor methodology would have to be redeveloped to correct those errors. The finite element errors would have to be corrected.

And then in no circumstance is it acceptable to take a finite element result and extrapolate that to long-term brain damage.

BY MR. RENZ:

Q. I understand you have other concerns about Dr. Hoshizaki.

In paragraph 32 of your declaration you

A. There are, again, multiple compounding errors at every stage of the analysis. And when you add them up, they only get bigger and bigger as they compound.

Q. And did you make a similar analysis for any of the other components regarding the rate of error?

A. Mr. Neale did an analysis of various errors involved in the video analysis and produced a -- found several errors and quantified them in terms of the rate of error. Dr. Panzer looked at the finite element modeling aspect of this and quantified several errors as well.

So at many stages of the analysis I've made an effort to quantify the rate of error.

Q. Is -- is one way to analyze -- is one unit of measurement for a rate of error a standard deviation between two measurements?

A. That would -- that could be a measurement of repeatability, which would factor into the error rate.

Q. In paragraph 33 of your declaration you state that based upon your review the application of overly simplistic theory created errors of approximately 50 to 80 percent.

modeling not giving you an absolutely correct number. It would -- you would not know how to scale from the tissue data to the finite element output. So that would be wrong, no matter what.

Q. Unless you had the data set that UVA is working on?

A. Correct.

MS. MILLER: Objection.

THE WITNESS: The nonexistent data set may someday help to resolve it.

BY MR. RENZ:

Q. You state in paragraph 38 of your opinion that the University College Dublin finite element model is minimally validated and, to the extent validated, it has large errors.

Do you see that?

A. Yes, sir.

Q. Okay. When you say it's been "minimally validated," what is it that you understand has been validated about that model?

A. My understanding is that this model, like many others, is validated based on basically two previous studies, biomechanical studies done, one in which deformation is injured at a few discrete points in the brain from a cadaver experiment with

radiopaque markers, and one relating pressure measurements to spill impacts.

And so together those studies provide a little bit of validation, but it's far from complete. That's why it's called a minimum level of validation.

Q. Okay. In order for it to be fully validated, you would want the data that we talked about you say doesn't exist that UVA is working on?

A. Correct. Because all of these other models out there are also validated against the same data set, and yet those models that you might call validated don't give the same results. They're different from each other. And that's because the validation data that exists is just not sufficient to completely validate the model. It's just a very minimal level of validation.

Q. The large errors that you refer to that the model has, what are you -- what are those, in your view?

A. That was described in Dr. Panzer's report, where he actually looked at specific data traces of the radiopaque markers in the study by Warren Hardy that I just talked about, and compared their traces to the UCD model outputs. And just

Dr. Funk, in paragraph 39 you assert that one of the assumptions of the finite element model used by Dr. Hoshizaki is that it is isotropic, while brain tissue is anisotropic.

Do you see that?

A. Yes, sir.

Q. Is this information that -- this information you know from your field?

MS. MILLER: Objection.

THE WITNESS: I know that brain tissue is anisotropic from my field, yes, sir.

BY MR. RENZ:

Q. Okay. And that Dr. Hoshizaki's analysis was using isotropic data, did you know that as well just from your own knowledge?

A. No. I'm relying on Dr. Panzer for that, for the analysis of this specific model. And he is the one who determined that it has an isotropic material model.

Q. Okay. So the first sentence is Dr. Panzer. The second sentence, once you know that, you believe it's false because you know from your own knowledge that the brain is in fact anisotropic?

A. Correct.

Q. Thank you.

MS. MILLER: Objection. You guys, please -- not you guys. You, please, let me have time to object.

MR. RENZ: All right. I'm going to go off the record.

VIDEOGRAPHER: Going off the record --

MS. MILLER: You want to take a break?

MR. RENZ: Yeah, I need to take one.

VIDEOGRAPHER: -- at the time of 10:56.

(Recess taken at 10:56 a.m.)

(Deposition resumed at 11:08 a.m.)

VIDEOGRAPHER: We are back on the video record. The time, 11:08.

BY MR. RENZ:

Q. Dr. Funk, when we last spoke we were speaking about paragraph 39 of your declaration. And one of the questions I had was about isotropic and anisotropic, that comparison of the first two sentences and where that information came from.

Looking at the remainder of paragraph 39 of your declaration, can you tell me whether these are assertions of -- that came from your knowledge or are these assertions of Dr. Panzer?

MS. MILLER: Objection.

THE WITNESS: In all of this, the general principles that are articulated come from my knowledge. The specific information relating to this particular brain model comes from Dr. Panzer's knowledge.

So the first sentence, as we discussed, would be information Dr. Panzer provided, that the model assumes an isotropic material. Second sentence, that the brain is actually anisotropic, is my personal knowledge.

The next sentence, that the axon fiber tracts are stiffer along their axes, is my knowledge. The next sentence is also my knowledge, that that would therefore overpredict maximum principal strain.

The next part is Dr. Panzer's knowledge, because it relates to the specific UCD model that was used. The fact that the GWV model assumes the brain is softer than the standard model and, therefore, overestimates MPS relative to the original model, is my conclusion, as well as Dr. Panzer's, of course. And the final sentence is mine as well.

BY MR. RENZ:

Q. Thank you.

as you think one ought to be?

A. Oh, several frames. I don't know. You would have to look at the data specifically to see what his behavior is.

Q. Okay. And then there's the impact that would also take some time, true?

A. The impact time is very short. We looked at Dr. Rousseau's thesis where he had numbers on the order of 11 to 25 milliseconds.

Q. And does that sound accurate?

A. Yes. That's similar to a football helmet impact.

Q. I'd like to ask you about paragraph 28 of your declaration. In this paragraph you hold out certain studies as exemplifying a different range of measurements than the one that Hoshizaki reached.

Do you see that?

A. Yes, sir.

Q. And you include in that a video analysis and computational modeling of concussive head pact -- head impacts in Australian rules football and rugby.

Do you see that?

A. Yes, sir.

there.
BY MR. RENZ:
Q. But I'm talking about these past seasons.
A. I don't know the answer to that. You may be right, it may not even be possible to get good information from that.
Q. Is that your belief?
MS. MILLER: Objection.
THE WITNESS: I have not -- I don't know. I haven't looked into that, the answer to that question.
BY MR. RENZ:
Q. But -- but you believe that the single-camera view of the video is, in and of itself, insufficient and creates scientifically unreliable results, right?
MS. MILLER: Objection.
THE WITNESS: In a large number of the analyses that were done here, yes. That, alone, renders the result scientifically unreliable.
BY MR. RENZ:
Q. And, therefore, at least as to those impacts, there would be no way, at least according to your view, that one could produce scientifically reliable data on how hard those impacts were on the

head?

A. Yes, that's correct. I mean, there are lots of videos of concussions that are just not good enough to reconstruct or to analyze.

MR. RENZ: I'm at a point -- I don't know what the status is with lunch. I understand -- I could break now or --

MS. MILLER: You want to break now and have lunch?

MR. RENZ: I'm saying we could. I'm just at a point.

MR. WYATT: You want me to go check outside and see if it's out?

MS. MILLER: It's not out, but can we -- are we off the record?

VIDEOGRAPHER: Would you like to go off the record?

MS. MILLER: Yeah.

VIDEOGRAPHER: Going off the record at a time of 11:53.

(Lunch recess taken at 11:53 a.m.)

(Deposition resumed at 1:05 p.m.)

(Mr. Wyatt is not present.)

VIDEOGRAPHER: We are back on the video record at the time of 1:05 p.m.

Did you say that you can't measure strain in the brain?

A. The strain displacement can be measured in the brain through the method that Hardy used, of the radiopaque markers. And strain can be calculated in a rough way from that. But you can't put a strain gauge on the brain. You can't measure it that way directly.

Q. I see. I see what you're saying. Okay.

Have you used or referred to MPS, maximum principal strain, as an indicator of any head trauma in any prior publication?

A. I don't believe so, no.

Q. In any prior testimony?

A. Not that I can recall.

Q. Okay. The results that are in Figure 10 of Dr. Panzer's declaration, they show, for example with head shake, a predicted maximum principal strain of greater than 45 percent, despite the fact that there was only a 4 g impact.

Do you see that?

A. Yes, I do.

Q. And I think this is the point of it, but does that seem absurd to you?

A. That's exactly the point of it. It's

completely absurd.

The point of this exercise was to take the model, which is in some sense a black box, and put in the input and see if it at least gives you reasonable output for certain scenarios. It needs to be able to discriminate injurious events from non-injurious events to be scientific reliable, scientifically reliable.

And in this case, putting in inputs for, you know, plopping in a chair or shaking your head or skipping rope produced strains that were extremely high that would -- Dr. Hoshizaki would say should result in concussion or serious brain injury, but they're clearly from non-injurious activities. So this demonstrates that the finite element modeling is not accurate the way Dr. Hoshizaki is using it.

Q. Have you, outside of this analysis and this figure but in the course of your study and your work, ever seen a strain that high from variables this low?

A. I would definitely not expect brain strains this high from the inputs this low.

Q. Have you ever seen anything like that in all your time and your analysis?

told me is that he used the model exactly as Dr. Hoshizaki did and just simply took out the inputs that Hoshizaki had put in and put these other inputs in. And so it should -- there should be no room for difference between the way he used the model and the way Dr. Hoshizaki used it.

Q. Have you reviewed, in the course of your work, the predicted or actual MPS resulting from impacts?

A. I have read research papers in which brain models are used and they would relate some of these kinematic variables to material variables like MPS. I am familiar with some of that literature.

Q. Do you recall what the highest maximum principal strain you have ever seen predicted when there's been an impact of less than 5 g?

A. No, I don't recall.

Q. Okay. Are you aware of any literature that supports MP -- predicted MPS results for these everyday activities at the levels set forth here by Panzer and documented in Figure 13 on page 36 of your declaration?

A. No. That's the point. I think these MPS levels are clearly in error.

matter damage or protein release at the 5 to 8 percent strain state; is that right?

A. I don't remember if he was specifically referring to those two things or not.

Q. Okay. What is -- when you talk about -- do you know what "functional alteration of a cell" means?

A. Yes, sir.

Q. Okay. What do you believe -- what do you understand that to mean?

A. That's an alteration in the function of the cell.

Q. Okay. And is it in the function of the cell -- is it in the ability of the function -- the cell to function?

MS. MILLER: Objection.

THE WITNESS: Yes, that's -- that's correct.

BY MR. RENZ:

Q. Okay. And do you believe that this is subject matter within your field?

A. By and large, the -- this is outside of my area, when we talk about the immunohistochemistry and the protein deposits, that sort of thing.

Q. Okay. There's quite a bit of discussion on it here, with a number -- in your declaration, including in paragraph 42, with a number of citations.

Do you see that?

A. Yes, sir.

Q. Okay. And so you're comfortable making the statements in this declaration about those things even though they're outside your field?

A. Well, let me -- let me be clear about it.

I am -- this -- these studies are biomechanical at least in part. They're all interdisciplinary studies that involve biomechanics and some immunohistochemistry and other types of things.

The biomechanical portion is squarely within my field of expertise and I certainly have experience working with interdisciplinary teams that do these other things. So I am qualified to interpret the literature in this area. And my opinions are really confined to the biomechanical area and what those parts of the study mean.

Q. And so when you make statements like "Electrophysiological disruptions in the axon at these low levels of axonal strain have been

reported to be reversible," you're making that statement based on the authority cited or is that also something that you would include in the biomechanical field?

A. I'm making that statement based on the authority cited.

Q. Okay. Even though it's not in your field, you have enough experience that you're comfortable using it?

A. Yes. I have -- for example, you know, I've done nerve testing and modeling of action potentials and measuring of electrophysiological aspects of nerves. I am familiar with the -- with that through my education, although it is not something that I do in my day-to-day practice.

MS. MILLER: Please try to remember to wait three seconds after a question, because I was trying to object to that question. Never succeeded. Thanks.

(Exhibit 7
marked for identification.)

BY MR. RENZ:

Q. Sir, I'm showing you what's been marked as Exhibit 7 to your deposition. It is an article entitled "Sodium Channelopathy Induced by Mild

A. No.
Q. Okay. And the last sentence of that paragraph talks about the "Undulations typical of axon injury were not observed in subthreshold injuries but were present in all suprathreshold populations."
Do you see that?
A. Yes, sir.
Q. Okay. Do you have any reason to disagree with their conclusion?
A. No, sir.
Q. Would axon injury, in your view, be enough to constitute injury?
A. Well, that, I think, is -- you're going to have to give me more information to answer that question.
Q. Sure. Could you --
A. I don't know what you mean.
Q. You're fine, that's fine. When that's true, I want you to tell me. That's fine.
I'm kind of looking back, my question stems out of your declaration paragraph 42, the second sentence where you talk about the spectrum of progressive cellular changes.
A. Yes, sir.

Q. And you start by talking about impairment and then -- and then you kind of move into damage and failure. And so what I'm trying --

MS. MILLER: Oh -- sorry.

BY MR. RENZ:

Q. What I'm trying to understand is when I look at Exhibit 7, this Yuen article, in the last sentence in that first paragraph under "Results," and it talks about undulations typical of axon injury, is axonal injury on the latter part of that spectrum that it is damage or failure as opposed to mere impairment?

MS. MILLER: Objection.

THE WITNESS: I think the word "injury" has been used in this paper, for example, to refer to electrophysiological impairment. So in the context of this paper, then the calcium channelopathy they describe as an injury. But it would be along that spectrum of changes.

BY MR. RENZ:

Q. Is it your understanding that what Yuen and her colleague -- I don't know if it's a he or she, but what Yuen and its colleagues were observing was not damage to brain cells at the 5 percent threshold?

entire brain is below a level of strain that causes any damage to any neuron, that that causes permanent brain injury. Which is just logically inconsistent and, therefore, scientifically unreliable.

BY MR. RENZ:

Q. Okay. If you won't or can't venture what the right tolerance would be to predict brain injury, is it possible that Dr. Hoshizaki is correct and you just don't feel that his basis is sufficient?

MS. MILLER: Objection.

THE WITNESS: I think there is a lot of evidence to indicate Dr. Hoshizaki is incorrect and far too low in his number. A more reasonable approach that is taken in all of the research literature is to search for a more of a census figure, a middle figure.

That's -- for example, Bain and Meaney in their report do a statistical analysis where they determine a certain level of strain represents a certain risk of injury and come up with, you know, conservative and liberal and optimal thresholds for injury. And that would be a more typical research approach, is to -- is to seek a more optimal or

middle number than the very lowest number you can find in any paper on any kind of nerve.

(Exhibit 8
marked for identification.)

BY MR. RENZ:

Q. Doctor, I'm showing you what's been marked as Exhibit 8 for your deposition. It's the -- it's an article by Bain and Meaney entitled "Tissue-Level Thresholds for Axonal Damage in an Experimental Model of Central Nervous System White Matter Injury."

Is this the Bain and Meaney article that you were just describing?

A. Yes, it is.

Q. And so the thresholds that you were also describing are the ones they've labeled as some liberal, some conservative, and some optimal, you were suggesting a better measurement might be something like the optimal?

A. Yes, that's one aspect of the Dr. Hoshizaki's analysis that I'm criticizing.

But probably the larger problem with relying on studies like this is that these are animal studies and you can't -- it's highly speculative to assume that a human brain or a human

would be done is with cadavers?

MS. MILLER: Objection.

THE WITNESS: I'm not suggesting that specifically. There are a number of approaches that are taken in the research world. I guess cadavers is one of them.

Q. Okay.

(Exhibit 9
marked for identification.)

BY MR. RENZ:

Q. Sir, I'm showing you what's been marked as Exhibit 9 for your deposition. It is a correction to your declaration with your signature.

Do you recognize this document?

A. Yes, sir.

Q. Okay. And in it, it talks about deleting a particular footnote from your declaration, specifically the -- or, excuse me, a sentence and the accompanying footnote that says "The lowest axonal strain level at which morphological damage has been shown to initiate is 14 percent"; is that right?

A. That's correct.

Q. Why did you make that correction?

A. Well, we just reviewed the Yuen study

that I noticed afterwards does make a reference to morphological changes at a lower strain rate.

Again, I am critical of the entire approach of just simply scouring the literature looking for the lowest possible number you can find, but -- because it's highly variable, depending on different kinds of cells and tissue preparations. But, in fact, there is one paper that did show morphological damage at less than 14 percent.

Q. Okay. What was that?

A. The Yuen paper. We just --

Q. Oh, yes, right.

A. The one we just talked about.

Q. Would you look at the Bain and Meaney article again, please, at page 619.

In the paragraph immediately above the bolded "Thresholds For Electrophysiological Impairment," do you see that paragraph that's right above that?

A. Yes, sir.

Q. Says "The area under the ROC curve was .95, suggesting that optic nerve strain is a very good predictor of morphological injury."

Do you see that?

design study for your published work?
A. I don't believe so.
Q. It's your -- do I understand you correctly that you assert that the analysis performed by Dr. Hoshizaki in this matter was a case-control design study?
MS. MILLER: Objection.
THE WITNESS: It's -- his -- whether it's case control or whatever his intent was, it's the same effect. There's a massive sampling bias in his approach. He does not have a cohort study, and that's what's required. So without a cohort, then it's not possible to get an absolute risk estimate.
BY MR. RENZ:
Q. Is it your understanding that Dr. Hoshizaki's report reported on all the impacts videoed in a game and then -- well, just leave it at that.
MS. MILLER: Objection.
THE WITNESS: I'm not sure I understand your question exactly.
BY MR. RENZ:
Q. Is it your understanding when you make these statements about Dr. Hoshizaki's studies, et cetera, in relation to whether there was a

cohort study and a case-control design, is it your understanding that his analysis reviewed all impacts that were videoed in the games that were analyzed?

A. Oh, in terms of his video analysis, I think he did try to get a representative sample. But that is a different area of the study than what I'm talking about here.

Q. Okay. Is it your assertion that the data in Dr. Hoshizaki's analysis and declaration was injury specific?

MS. MILLER: Objection.

THE WITNESS: I don't understand the question.

BY MR. RENZ:

Q. Do you have any reason to believe that Dr. Hoshizaki did not report all impacts, regardless of injury, in his study?

MS. MILLER: Objection. What -- can you explain what you mean by "all impacts"?

MR. RENZ: All right.

MS. MILLER: Just because the whole basis of the study is that he selected impacts, I literally don't understand that question.

MR. RENZ: Okay. I will try and reword

it.

MS. MILLER: Okay.

BY MR. RENZ:

Q. Is it your assertion that Dr. Hoshizaki did not report all the impacts observed in the game footage, regardless of whether they resulted in injury, when he did his video analysis?

A. I don't recollect that he had any injuries that he reported on. And I'm -- to the extent I understand your question, I don't have any information that he selectively excluded data, if that's what you're suggesting.

Q. I'm just -- I want to make sure that I understand the contours of what you were talking about when you say that he did not have a representative sampling. I understand your issue isn't necessarily with the video part. I'm trying to eliminate that.

A. Oh, then that's fine. No, I'm not talking about the video part at all in this paragraph.

Q. Okay. In paragraph 51, Dr. Funk, you describe having conducted a study comparing risk curves using HITS data from a cohort study to analogous curves based on a case-control

nerve stretch studies. It kind of corresponds to the Figure 9, was it, in my declaration, with the green and the blue bars. That's what the colors indicate, the green being electrophysiological impairment, and the blue being morphological damage.

Q. Do you have a reason to believe that the Yuen, not Yu, the Yuen study, is scientifically unreliable?

A. No, sir.

Q. Okay.

(Exhibit 15
marked for identification.)

BY MR. RENZ:

Q. Sir, I'm showing you what's been marked as Exhibit 15 to your deposition.

Do you recognize this document?

A. Yes, sir.

Q. Could you please tell me what it is.

A. This is a printout of a spreadsheet I made that I used to calculate the values depicted in the charts in Figure 2, 3, and 4 of my report, regarding the effective mass calculations in the -- for the impactor development study that we discussed earlier.

manner the number of times that an NHL player in prior seasons has received a head impact of a certain impact value or strain value?

MS. MILLER: Objection. Asked and answered.

THE WITNESS: Again, I -- that's so hypothetical, I would just need a lot more information to answer that question.

BY MR. RENZ:

Q. I mean, what I'm trying to -- what I'm trying to figure out from you, Doctor, is that I understand that you have concerns with Dr. Hoshizaki's use of Yuen's article in setting that 5 percent level.

But outside of making a correlation to injury, is it -- do you believe that it's possible, in a scientifically valid manner, to measure the impact of hits in prior games in the seasons that we're talking about, in a scientifically valid manner?

MS. MILLER: Objection. Same objections.

THE WITNESS: I think --

MS. MILLER: Objection to form and asked and answered.

THE WITNESS: Yes, I think we're going

back to a previous discussion. And based on the information that I've seen, which consists of no sensor data and a single camera view of various impacts, that's not enough.

BY MR. RENZ:

Q. Do I understand your assertions correctly that one of the reasons you believed accounting for post-impact velocity is important is that it properly accounts for the difference between direct blows and glancing blows?

MS. MILLER: Objection.

THE WITNESS: That's correct.

BY MR. RENZ:

Q. Can the dynamic headform, coupled with a compliant neck and sliding table, account for direct versus glancing blows?

MS. MILLER: Objection.

THE WITNESS: It can't match something that's not measured. You can certainly hit something directly or with a glancing blow, but you can't accurately reproduce a blow that you don't know what occurred in it. In other words, if you only have an impact velocity, you know, a velocity in, then you don't know whether that was a direct blow or a glancing blow.

accelerations. So having those nine accelerometers doesn't do you any good if you don't have the necessary input to the test.

Q. Which you believe has to include the post-impact velocity?

A. Correct.

Q. Do you have any dispute that the dynamic headform and its responsiveness have been validated?

A. Are you talking about the Hybrid III --

Q. Yes.

A. -- headform? Yes, it has been validated to some extent.

Q. Would you turn to page 21 of your declaration, please.

MS. MILLER: Page?

MR. RENZ: Sorry, paragraph, you're right.

MS. MILLER: I didn't know. I wasn't right.

BY MR. RENZ:

Q. You state that "The stiffness of the other player's body was reproduced by a commercially available ice hockey pad on the impactor face."

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MINNESOTA

IN RE: NATIONAL HOCKEY LEAGUE PLAYERS' CONCUSSION INJURY LITIGATION	)	
	)	MDL No. 14-2551 (SRN/JSM)
This Document Relates to: ALL ACTIONS	)	

CORRECTION TO DECLARATION OF DR. JAMES R. FUNK

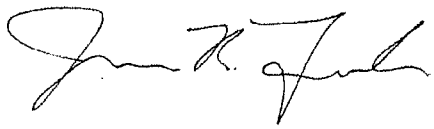
Paragraph 42 of my declaration should be revised to delete the following sentence and its accompanying footnote: "The lowest axonal strain level at which morphological damage has been shown to initiate is 14%."

This change does not affect my overall opinions.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 8th day of August, 2017.

Respectfully submitted,



James Funk, PhD, PE

EXHIBIT
9 1-26-18
FUNK SHCW